

Claims

What is claimed is:

1. A method of maintaining a terrestrial cell site handoff list for an airborne cellular system comprising:

5 maintaining a beam pattern of communications beams transmitted from an airplane relative to cellular system users;

determining a location and heading of the airplane;

determining locations of respective beams transmitted from the airplane based on airplane flight pattern data;

10 determining locations of respective cell sites within a vicinity of footprints of the respective beams transmitted from the airplane; and

calculating a list of viable handoff terrestrial cell site candidates based on the maintaining of a beam pattern, the determining of a location and heading of the airplane, the determining of locations of respective beams transmitted from the airplane based on airplane flight pattern data, and the determining of locations of respective cell sites.

2. The method of claim 1, wherein the determining of a location and heading of the airplane comprises determining a flight pattern location of the airplane via a telemetry link.

3. The method of claim 1, wherein the calculating of a list of viable handoff terrestrial cell site candidates comprises mapping data generated from the maintaining of a beam pattern, the determining of a location and heading of the airplane, the determining of locations of respective beams transmitted from the airplane based on airplane flight pattern data, and the determining of locations of respective cell sites to a cell site location database to determine the viable handoff terrestrial cell site candidates.

4. The method of claim 1, further comprising ranking each of the viable handoff terrestrial cell site candidates based on associated probability data found during the calculating of a list of viable handoff terrestrial cell site candidates.

5. The method of claim 4, wherein a number of the viable handoff terrestrial cell site candidates found during the calculating of a list of viable handoff terrestrial cell site candidates is protocol-dependent.

6. The method of claim 1, wherein the calculating of a list of viable handoff terrestrial cell site candidates is performed for each of the respective beams transmitted from the airplane.

7. The method of claim 6, further comprising dividing up the list of viable handoff terrestrial cell site candidates into multiple candidate groups according to candidate geographic locations within each of the respective beams transmitted from the airplane; and cycling through the multiple candidate groups to further reduce the list of viable handoff terrestrial candidates based on the multiple candidate groups.

8. The method of claim 7, wherein the cycling through the multiple candidate groups introduces an associated handoff delay.

9. The method of claim 1, further comprising updating the list of viable handoff terrestrial cell site candidates as a function of time as the airplane flight pattern data changes.

10. The method of claim 1, wherein the calculating of a list of viable handoff terrestrial cell site candidates is performed to compensate for airplane flight pattern changes caused by adverse weather conditions.

11. The method of claim 1, further comprising calculating viable airplane beams for receiving handoffs from terrestrial cell sites; and creating an airplane beam handoff list based on the calculating of viable airplane beams.

12. The method of claim 1, further comprising dividing the list of viable handoff terrestrial cell site candidates into time-sensitive candidates and non-time-sensitive handoff candidates.

13. In a cellular communications system having an airborne repeater, an apparatus for calculating a list of terrestrial cell site handoff candidates, comprising:

a receiver for receiving airplane flight pattern information; airplane beam pattern information regarding geographic coverage of communications beams transmitted from the airplane and terrestrial cell site location information;

a database for storing handoff coordination information; and

a processor for calculating a handoff candidate list based on information from the receiver and the database to enable calls to be handed off from the communications beams transmitted from the airplane to terrestrial cell sites in a manner that optimizes call traffic routing.

14. The apparatus of claim 13, wherein the flight pattern information comprises airplane location, heading, and beam footprint information.

15. The apparatus of claim 13, wherein the receiver, the database and the processor are implemented in a ground-based base transceiving station.

16. The apparatus of claim 13, wherein the receiver, the database and the processor are implemented in the airplane and communicate with a ground-based control station via a telemetry link.

17. The apparatus of claim 13, wherein the handoff candidate list includes cell sites within a single communications beam.

18. The apparatus of claim 13, wherein the processor is for dividing each of the communications beams into groups of cell sites within each of the communications beams and for cycling through the groups of cell sites to further reduce the handoff candidate list.

19. The apparatus of claim 13, wherein the processor is further for calculating a handoff list for terrestrial cell sites to candidate communications beams.